INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 3 (2018) PAGES 3692 - 3696
RECEIVED : 20.05.2018 PUBLISHED : 06.06.2018
June 06, 2018

DESIGN AND IMPLEMENTATION OF REAL TIME TRANSFORMER HEALTH MONITORING SYSTEM USING GSM TECHNOLOGY

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Abstract:

Development of national economy as well as power system, reliability and safety issues of power system have been more important. This transformer health monitoring system can monitor the health status of the distribution transformer in real time aspect. As a large number of transformers are distributed over a wide area in present electric systems, it's difficult to monitor the condition manually of every single transformer. Maintenance of transmission and distribution lines trouble free is one of the daunting tasks of the equipment branch department. One of the problems that act as a headache for both the customers and the equipment branch is the transformer maintenance. At many times the failure of the transformer gets unnoticed and the customer think the power has been shut down and the equipment branch personal do nothing as they do not know about their failures. Also the transformers are located in far off places in remote corners of towns, cities and villages. In all these cases it's very difficult to appoint a person to monitor those transformers. Sometimes in villages, people themselves claim the transformers to rectify the fault instead of calling the line man. This leads to untoward accidents and safety hazards. The unique way of monitoring the transformers with the help of global system for mobile communication technology using the existing mobile phone towers. Transfer data through a wireless medium such as internet of things using existing mobile phone towers.

1. INTRODUCTION

Electricity plays an important role in our life. Every moment of our life depends upon electricity. Electricity has several components and equipment helping human to transfer and regulate the distribution according to usage. The most crucial equipment of transmission and distribution of electric power is transformer. The majority of these devices have been in service for many years in different (electrical, mechanical and environmental) conditions. However, their life is significantly reduced if they are subjected to overloading, heating, low or high voltage/current resulting in unexpected failures and loss of supply to a large number of customers thus effecting system reliability. Abnormality in distribution transformer is accompanied with variation in different parameters like Winding temperature, Oil temperatures, Ambient temperature, Load current, Oil flow (pump motor), Moisture and dissolved gas in oil, Leave travel concession monitoring, Oil level, Bushing condition. Overloading, oil temperature, load current and ineffective cooling of transformers are the major causes of failure in distribution transformer. As transformer is a combination of many parts, this all parts must be checked regularly to maintain the transformer in perfect operating conditions. It leads to online monitoring of main functional parameters of distribution transformers which will provide necessary information about the health of distribution transformers. This will help and guide the utilities to optimally use the

transformers and keep this equipment in operation for a longer period. An online-monitoring system is used to collect and analyse temperature data over time .Transformer health monitoring system will help to identify or recognize unexpected situations before any serious failure which leads to a greater reliability and significant cost savings. Widespread use of mobile networks and GSM modems, have made them an attractive option both for voice media and wide area network applications.

2. LITERATURE SURVEY

"Information Abstraction for Heterogeneous real world internet data." IEEE Sensor journal 13,10 2016. Ganz, F., Barnaghi, P.; Carrez, F., proposed the transformers are one of the most important equipment in power network. Because of, the large number of transformers distributed over a wide area in power electric systems, the data acquisition and condition monitoring is a important issue. This paper presents design and implementation of a mobile embedded system and a novel software to monitor and diagnose condition of transformers, by record key operation indictors of a distribution transformer like load currents, transformer oil, ambient temperatures and voltage of three phases. The proposed on-line monitoring system integrates a Global Service Mobile (GSM) Modem, with standalone single chip microcontroller and sensor packages.

"Real-time Temperature Monitoring System Using FBG Sensors on Power Transformer", May, 2016. Bajjuri Praneeth Kumar & Boda vamsee Krishna babu , proposed Over-heating issues will affect the safe operation and life-time of an oil- immersed transformer; therefore, it is necessary to monitor the temperature of the windings and oil during a transformer's operation. Fiber Bragg Grating (FBG) temperature sensors are installed to measure the temperature of windings, cores, and busbars, as well as oil temperature at the top and bottom. An online-monitoring system is used to collect and analyse temperature data over time.

" Remote condition Monitoring system for Distribution Transformer System", NPSC, Augest 10, 2016. T R Pawer, Priyanka A.Wagh, proposed the implementation of a mobile embedded system to monitor and record key parameters of a distribution transformer like load currents, oil level and ambient temperature. The idea of on-line monitoring system integrates a global service mobile (GSM) Modem, with a standalone single chip microcontroller and different sensors. It is installed at the distribution transformer site and the above parameters are recorded using the analog to digital converter (ADC) of the embedded system. The obtained parameters are processed and recorded in the system memory.

3. PROPOSED SYSTEM

Design and implementation of a mobile embedded system to monitor load currents, over voltage, transformer oil level and oil temperature. The implementation on-line monitoring system integrates Global Service Mobile (GSM) Modem, with single chip microcontroller and sensors. It is installed at the distribution transformer site. The output values of sensors are processed and recorded in the system memory. System programmed with some predefined instructions to check abnormal conditions. Transformer health monitoring system can monitor the health status of the distribution transformer in real time aspect. As a large number of transformers are distributed over a wide area in present electric systems, it's difficult to monitor the condition manually of every single transformer. So automatic data acquisition and transformer condition monitoring has been an important issue. As it is a wireless communicating system, there is no need of large cables which are of high cost. Thus transformer health monitoring system offers a more improved transformer monitoring. All the sensors, processing controller and GSM modem initialization occurs. After the initialization process required data's are

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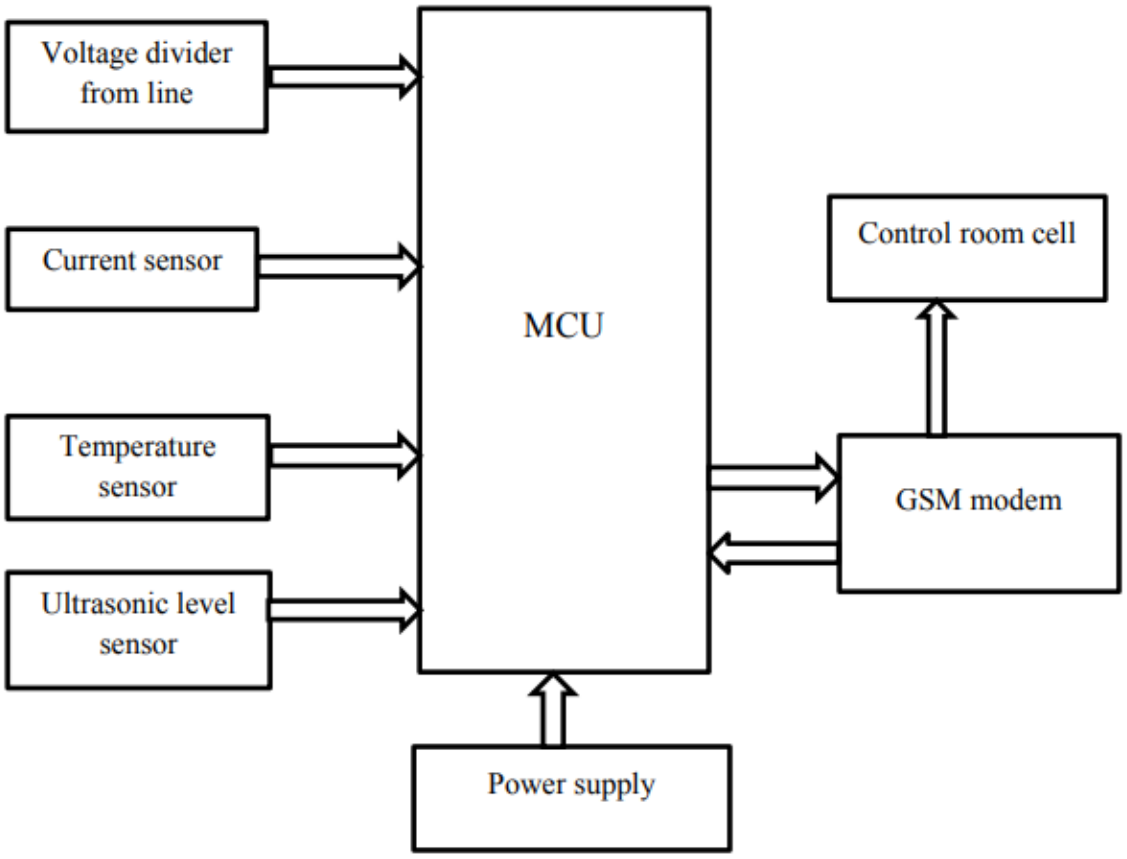

Fig.1.Proposed System

measured from sensors and some common used components simultaneously. Then the microcontroller starts to compare the incoming values with the saved values in the EEPROM memory. When there is at least one parameter's value denied the saved value, then the microcontroller takes action to send this message to the controller cell. If there is no over rated values of current and voltage or oil level is in safer level or the oil temperature is in the predefined value range, then the microcontroller jumps back to the testing procedure. This process continues until the decision making logic's output is negative.

4. METHODOLOGY

Transformer health monitoring system will help to identify or recognize unexpected situations before any serious failure which leads to a greater reliability and significant cost savings and also Detect faults in remote transformers lines. Widespread use of mobile networks and GSM modems, have made them an attractive option both for voice media and wide area network applications. Immediately transmit any fault information to multiple people including line man, power house, EB office etc. Using a IOT and a smart electronic monitoring device attached to the transformer. Many parameters of the transformer such as temperature, Oil level, voltage output are monitored continuously. Transformer Health Monitoring System through GSM module is Cost effectiveness and remote location will be given priority. In case of software driven system total system requires lot of connection and apparatus and technically skilled personnel. Fault information will available only in control room. Transfer data through a wireless medium such as IOT using existing mobile phone towers. This system designed for

online monitoring of distribution transformers parameter can provide useful information about the transformers health which help the utilities to optimally use their transformers and keep the asset in operation for long time. In this system, we used three sensors for monitoring that is voltage sensor, a current sensor, and temperature sensor. We used a power supply to operate pic 16F877A microcontroller.

5. ANALYSIS

Microchip has a large suite of software and hardware development tools integrated within one software package called MPLAB Integrated Development Environment (IDE). MPLAB IDE is a free, integrated toolset for the development of embedded applications on Microchip's PIC and ds PIC microcontrollers. It is called an Integrated Development Environment or IDE because it provides a single integrated environment to develop code for embedded microcontrollers.MPLAB IDE runs as a 32-bit application on MS Windows, is easy to use and includes a host of free software components for fast application development and super-charged debugging.

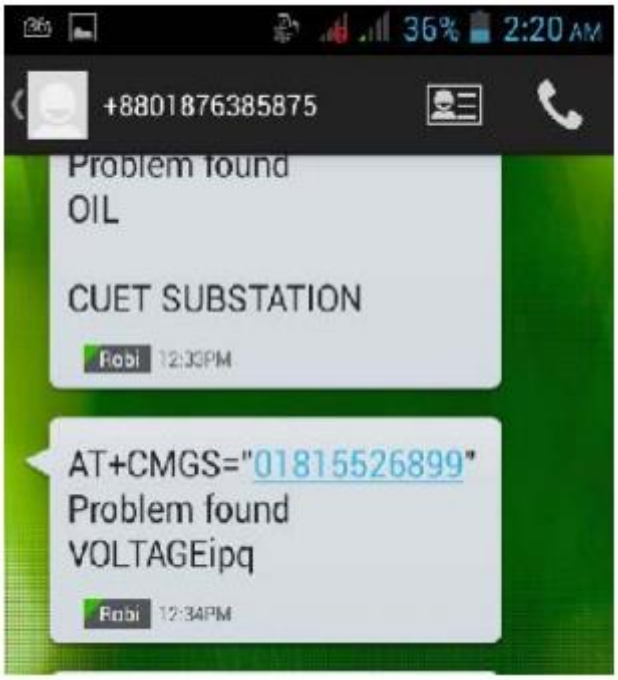

Fig.2.Output

MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving between tools is a snap, and upgrading from the free software simulator to hardware debug and programming tools is done in a flash because MPLAB IDE has the same user interface for all tools.It is small and simpler to learn, understand, program and debug. Compared to assembly language, C code written is more reliable and scalable, more portable between different platforms. C compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers. Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems. As C combines functionality of assembly language and features of high level languages, C is treated as

a 'middle-level computer language' or 'high level assembly language'. The infrastructure needs to support applications in finding the things required. An application may run anywhere, including on the things themselves. Finding things is not limited to the start-up time of an application. Automatic adaptation is needed whenever relevant new things become available, things become unavailable or the status of things changes. The infrastructure has to support the monitoring of such changes and the adaptation that is required as a result of the changes.

CONCLUSION

Detect faults in remote transformers lines. Immediately transmit any fault information to multiple people including line man, power house, EB office etc. Transfer data through a wireless medium such as IOT using existing mobile phone towers. The final stage of Electricity distribution is the delivery of electricity from generating power plants to end users. Distribution system's network carries electricity by the transmission system and delivers its load centers. Thus, it is very essential to have high efficiency, high reliability and high service quality in a distribution system. This study gives remedies from the difficulties of determining fault occurring causes in transformer and it overcomes the drawbacks of previous working methods.

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